

ther it was for the Husband or Wife, for it may be read *Antoniae*. The Points also betwixt the words are here very singular, but this was the caprice of the *Stone-cutter*, who sometimes also use a Leaf, hanging or erect, a Hand, a Feather, or such odd fancy for Points.

*An Abstract of a Letter from Mr. Anthony  
Leewenhoeck writ to Sir C. W.*

*Jan. 22. 1683. from Delft.*

HAVING lately met with a Book published by a Physician of our Country, which treats of Humane Generation, and the *Egg-branch* as it is found in Women-kinds and not doubting but what is there said, is also applicable to Four-footed Beasts, I examin'd (in the presence of a Physician and other learned Persons as well as alone) the *Egg-branches* of several Lambs of a year old, that had been several Months in the Winter kept in a Stall for fattening, separated from the *Ramms*. From what I have hitherto found I cannot but wonder why it should be generally believed, That the *Tuba Fallopiana* does draw, or suck down an *Egg* from the *Egg-branch*, thro so narrow a passage, as I shew'd the *Tuba Fallopiana* to have. Considering therewithal that some of the *Eggs* were as big as Peases, and others as large as the whole *Egg-branch*: That they were made up of Glandulous parts interwoven with Blood-Vessels, and were shut up so fast in their Skins or Membranes that I could not with my Nails tear one of them from the *Egg-branch*: That some of them consisted of very irregular and unlike parts, which were in some places inclosed in particular Skins, and had not at all the shape of an *Egg*: That some of them which stood out beyond the rest were burst open; and yet when I went to pull them  
off

off, they stuck so fast, that the whole *Egg-branch* came along with them. The smallest *Eggs*, and of a lesser size, were also firmly rooted and fixt in their skins, and had often a Watery substance in them. That besides the supposed *Eggs* of the *Egg-branch*, there were others lying at a distance from it of an Inch and more, on each side of the *Womb*, and were included in particular *Skins*.

My Opinion therefore of these *Eggs* is, that they are *Emanatorys*, or the *Emptyings* of some *Vessels* lying near, such as are often found among the *Membranes*, or adhering to the *Bowels* of *Animals*. But as to *Generation* tho I have formerly been very reserv'd in declaring my thoughts thereof, yet being now further instructed by manifold *Experiences* I dare venture to affirm it rather to come from an *Animalcule*, (such as I find not only in *Human Seed*, but that of all *Birds*, *Beasts*, *Fishes*, and *Insects*) than an *Egg*. And the rather for that I find in the *Seed* of a *Man*, as also of a *Dog*, two different sorts of *Animalcules*, answering the different *Sexes* of Male and Female.

I know some men will even swear that they have found the aforesaid *Eggs* in the *Tuba Fallopiana* of *Beasts*. But I need not believe that these round Bodies they have seen in it, should be drawn down from the imagined *Egg-branch*, thro the long and very narrow passage of the *Tuba Fallopiana*, Because some of the Bodies are as big as a *Pease* (nay as the whole *Egg-branch*); and of a very firme and compacted Substance: But the way thro which they should pass is no wider than the Compass of a small *Pin*. Again if it were so as is said, these bodies would be found, not by Chance, but always when searched for immediately after *Copulation*; but that is so far from being true, that it is hardly to be imagined, if we consider how little time is taken up in the *Copulation* of several *Animals*, as a *Cow*, *Rabbit* &c. In which so short time nevertheless ought to be drawn down, thro a long and narrow Passage, a great number of Bodies; in some Cases two or three, in others

Six or Eight, and more, according to the number of *Fætus*'s to be produced.

But supposing such Bodies there to be found, why may they not be formed *ex residuo Seminis Masculi*, gathered together into a *Ball* or *Globule*; as we see several other Substances in Animals that are neither of too thick nor too thin a Consistence, as *Fat*, *Sanies* &c. which how they are made, I have formerly given an account. Or Secondly there being no part of the Body which is not nourished, and which does not cast off somethings that are superfluous, why may there not in the *Womb* or *Tuba* be several Excretions made which by Compression on all sides may be brought into a round figure? This supposal being true, it will follow that *Egg-like* Bodies are also in the *Womb* or *Tuba* of Females that have not accompanied with the Male.

It may be queried, If one *Animalcule* of Seed be sufficient to produce a *Fætus*, why are there so many Thousands in one drop of it?

I answer that in an *Apple-Tree* (enduring an Hundred years and bearing every year a great many Thousand Blossoms, which may a great part of them be *Apples*, having each of them Six or Eight Seeds) each Seed being placed in a proper Soil, and carefully cultivated, is capable of becoming a Tree; yet it may happen that nothing grows from all the Apples that fall down; whether thro want of Sun, Rankness of Grass, Weeds, or other Accidents. So in the *Womb* each *Animalcule* might suffice for a *Generation*, if the place where it comes to be nursed be fit for it; But the *Womb* being so large in Comparison of so small a Creature, and there being so few *Vessels* and places fit to feed it, and bring it up to a *Fætus*; there cannot be too great a number of Adventurers, when there is so great a likelihood to miscarry.

It may be asked again, why a *Woman* bringeth forth but one or two Children, since if there were but two proper pla-

places in a *Uterus*, several of the *Animalcules* might there be fed.

I answer, it may happen to these *Animalcules*, as it does to Seven or Eight *Seeds* put into a small hole of the ground; that *Seed* which puts out the biggest and strongest Root, starves all the rest, and becomes a Tree.

It may be asked me again, why I make the *Animalcules* found in the Seed of several Animals to be of such different Sizes, comparatively to the Animals they belong to viz. in the space of a small Sand in the Seed of a *Cock* 50000. in the Row of a *Cod-fish* 10000. in the Row of a *Ruff* (which fish is a 1000 times less than a *Cod-fish*) the *Animalcules* as big as the others. Whereas it seems reasonable that the *Animalcules* ought to be in bigness to one another, as the *Creatures* in which they are found; from whence it would follow, that those *Animalcules* which are in *insects*, would never be capable of being discovered, because of their exceeding smallness.

I answer that we must satisfy our selves in these things; as well as we can, for (not to speak of a *Coco Nut*) a great *Wall-nut* with his green shell weighs down a 1000 *Apple Tree Seeds*, and yet the proportion between the Trees is not so great.

In my Letter of the Third of March 1681 I described the texture of a *Flesh* and *Fish-muscle*; But have since examined that of a *Flea*, as judging that if I could find the same *Filament*, I might be positive that the Muscles of *Animals* are all of the same make; haveing therefore several times separated and exposed to View that *Muscle* of the Breast, whereto the Leg is partly fastned; I observed the same *Ring-like Indentings* in the *Filaments*, that I had seen in other places. Some appeared to me thicker in the middle then at the ends as *Tub. 2. Fig. 1. A B C D E F G H* is the Description of the *Filament* of a *Flea* broken out of the Breast, from which I perceived the *Filaments* of this Insect to grow Tapering towards the ends, and lose themselves

in a *Membrane* or *Tendon*, like the *Filaments* of the *Muscle* of an *Ox*. Some of the *Indentings* were as *C F*, but most throughout were as *A B G H*. Several times I had an appearance as if a *Filament* were constituted of several lesser threads joyned together, and lying by the sides of one another.

In pursuing my *Observations*, I took some of the *Flesh* of the *Legs* of the *Flea*, and found it like that of the *Breast*; here I counted 12. of these before named *Filaments*, and some threads without *indentings* which I conceived might be *Vessels*.

I also with much trouble took out the *Testicles* of a *Flea*, and placed them before my *Microscope*, and drew out the *Figure* as well as I could, as *Fig. 2*. *A B C D* is the *Testicle*, *A F* and *D E* are the *Vasa Deferentia*, when the *Testicles* were first taken out they were of a dark Colour, but in less then 1/2 of a minute their *moisture* was evaporated, and then they became crumpled, which I have here represented as well as I could.

I also searched for the *Vessels* having as it were *Rings* about them (of which I have formerly spoke) and am satisfied they cannot be *Air Vessels*, but rather *Arteries*; for I saw them not only encompass the *Guts* but spread over and among the *Eggs*.

The *Sting* or *Snout* of the *Flea*, or rather the *Sheath* of it in which it is kept, had *Teeth* on each side like a *Saw*; and may not unfitly be compared to a *Quill* that is split ragged. When the *Sting* is enclosed in the *sheath* the *Teeth* on each side go between one another. The length of this *Sheath* is about *Three Diameters* of the thickness of a *Hair*,

I have made many *Attempts* the last *Autumn*, to find out in what time the *Worm* coming from the *Eg* of a *Flea*, would become a full grown *Flea*. The *Egs* of a *Flea* kept in a warm place were hatched in four days, and became *Worms*, which I endeavored to bring up, but notwithstanding

ding all my endeavours I could keep them no longer alive than Twelve daies. When I placed about the half of a small *Flye* in the glafs by the *Worms* for their Food; the part of the *Flye* caufed fuch a *Steam* on the glafs that the *Worms* being hairy were intangled in the moiſture, and remained immoveable till they died. When the *Worms* were Twelve daies old, they were about the length of Four *Eggs* and the thicknefs of One. Since I could bring up no *Worms*, I took fome which I thought had attained their full growth, and obſerved the ſame to ſpend Eight or Ten daies in *Spinning* their *Web*, and then they ſtrip of their *Skin* and became a *Nympha*. Theſe *Nympha's* I ſaw move on the Fourth day, tho they were Clear and White: on the Sixth they were Red about the Head: on the Tenth they broke their *Cafe*, which was a very thin *Skin*, and leapt into the Glafs, liveing there without Food for the ſpace of Seven daies

I alſo took ſome fleſh from the Breſt of a *Lowe*, and found the *fleſh Threds* of the ſame make as thoſe of the *Flea*.

I took alſo the fleſh from the feet of a *Gnat*, and found that of the ſame make with the former. But perceiving the Legs and Body of the *Gnat* to be furniſhed with very fine *Feathers*, I have cauſed them to be drawn as Fig. 3. The *Wing* alſo of the *Gnat* being adorned with *Feathers*, I have drawn that too as Fig. 4. which is a *Wing* as it appears to the naked Eye. Fig. 5. A B C is the ſame repreſented in a larger proportion, to ſhow that not only the whole Circumference of the *Wing*, as here 5. A B C is beſet with great and ſmall *Feathers* as Fig. 6. But alſo the *Nerves* that ſtiffen the *Wing*, as D D D D. The *Film* of the *Wing* which is between the *Nerves* D D, ſeemeth by the *Microſcope* to be full of a great many ſmall Riſings; but upon a ſtricter Examination, they are really ſmall *haire*s, as Fig. 7, where a beginning was made to repreſent the whole *Wing*: A B C are the *Feathers*, and A D E C are the *haire*s on the *Film*.

A certain Physician having told me that several people afflicted with *Agues*, had been cured thereof by the use of *Sal volatile Oleosum*, which had attenuated and rarified their blood. I resolved to make what observations I could, of the mixture of that *Salt* with *Blood*. And therefore pricking my finger with a *needle*, I put the first time two parts of *Blood* to one of *Salt*; a second time equal parts of each. The *blood* turned immediately of a more lively red color, as blood usually does when mixed with *fair Water* (for I am of the Opinion that when blood running from a Vein is of a dark-red or blackish colour, the reason of the blackness is, that the *Globules* which make the blood red are not sufficiently diluted with that liquor which Physicians call the *Whey* of the blood).

Upon viewing my *Blood* one day, I found it somewhat blacker than ordinary, but not reflecting thereon, and the next day working till I sweat, I was seized with an *Ague*; which I then thought might be caused by the thickness of my *Blood*; and therefore bethought my self of such things as would attenuate it, drinking a great deal of *Warm Tee*, and *Indive* self very well therewith, I continued it, until I took a little small bear, eating little but a *Sallet* or *Endive*. Upon the Fourth day my *Urine* came again to its Natural Color.

But to come more particularly to the alterations made in the *blood* by *Sal Volatile Oleosum*. The parts of that blood that lay nearest the *Salt*, changed colour first, and by degrees those further distant. But taking my *Microscope* to observe it, I found the *Blood Globules* each to be dissolv'd into Six distinct *Globules*.

I then took Four parts of *Salt* &c. and one of *Blood*, and viewing it as quick as I could with my glass I found some of the *Blood Globules* much diminished in  $\frac{1}{2}$  of a minute, but in  $\frac{1}{2}$  of a minute they were wholly dissolved. I saw once 20 *Blood Globules* at a distance from the rest, but in continuing to tell them they came first to 18. then 16. after to 3. or 2. which also were dissolving. There

There was also here and there a *Globule* that would not dissolve; nor with a very little *Salt* would any.

What may be the *Cause* of these *Effects*, I cannot say, but as to the *Effects* themselves, I imagine that the *Sal Oleosum* being taken inwardly, and conveyed into the *Lactes*, and *Veins*, may have the force to hinder the Compounding the *blood Globules*, by which means the *blood* may become more *thin*, and perform its *circulation* more easily. An effect not altogether unlike this, we have from the *Brimstone-Match*, with which the *Wine-Coopers* smock their *Cask's*, thereby to hinder the *wine* from thickning and working. But *Brimstone* hath not the force of making *Wine* that is already thick, grow thin.

I lately read a *Physitian* of our *Country*, who affirms there is a *fermentation* and rising in the *Blood*, caused by the Intercourse it has with the *Air* in the *Lungs*, as we see a Rising in *Dough* caused by *Yest*.

That there is a great deal of *Air* swallowed down into the *Stomack* with our *meat*, (and some made out of the *meat* it self) which afterwards enters the *Blood*, I do not deny, nor that there may be *Air* contained in the *blood*, in the same manner as there is in *warm Water*, or *Wine* that does not work. But I can't conceive there should be such large *bubbles* in the *blood*, as are caused in *Dough* by *Yest*, for these *Bubbles* moving in a liquid body, whenever their *Superficies* came to touch, would unite together; whence it would follow, that a great part of the *Blood-Vessels*, would be full of nothing but *Air*. Again if there were *Air bubbles* in the *blood*, that a 1000 times less than a *Sand*, I should have discovered them, in my many *Observations* made about the *blood* for 11. or 12. years last past.



Fig. 1.

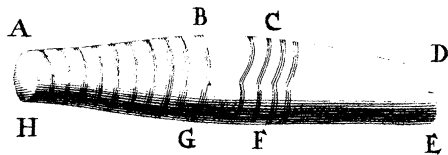


Fig. 2.

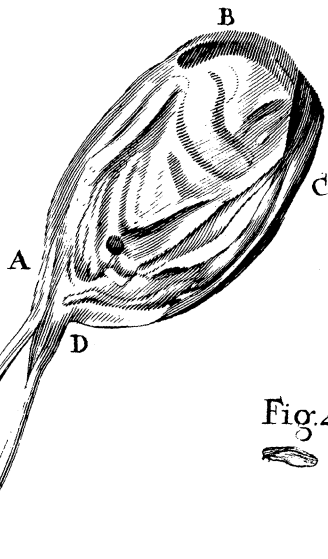


Fig. 3.

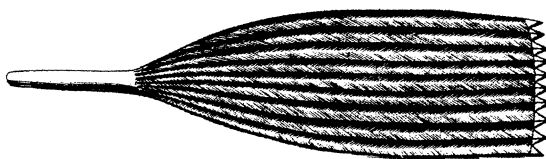


Fig. 4.



Fig. 5.

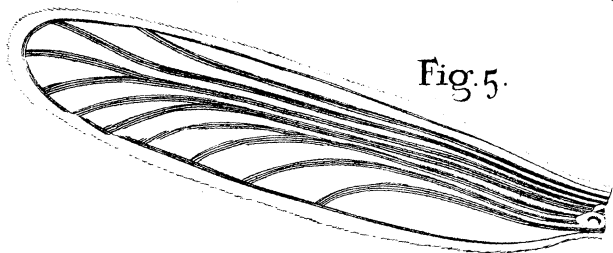


Fig. 6.



Fig. 7.

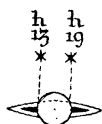
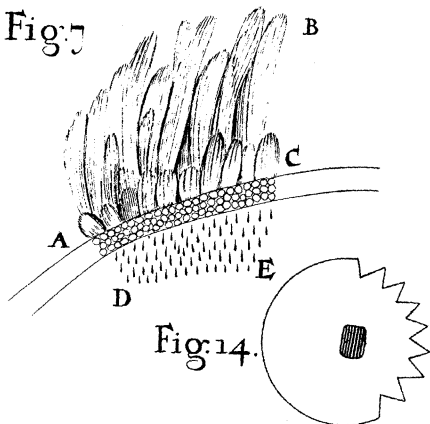


Fig. 8.

Fig. 9.

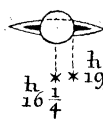


Fig. 10.

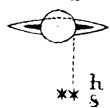


Fig. 11.

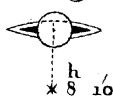


Fig. 12.

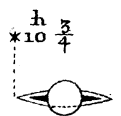
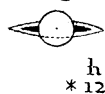


Fig. 13.